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ORGANIZING CONSTRUCTION PRACTICES IN DIFFERENT CULTURAL CONTEXTS

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This paper presents in-depth case studies of construction practices with a specific focus on understanding the emergent and dynamic nature of construction management in different cultural contexts. The cases are based on actual working-experiences by the author as an assistant project manager participating in the construction management on site working for three different contractors in different cultural contexts: (1) Construir Futuro S.A. in Quito, Ecuador; (2) Anker Hansen & co. A/S in Copenhagen, Denmark; and (3) E. Pihl & Soen A/S in Stockholm, Sweden. Based on these explorative case studies a number of characteristics and challenges related to the cultural context have been identified highlighting a central issue in existing and future construction practices due to the globalization and thereby increasing importance of cultural understanding in project-based organizing. The empirical findings emphasize a significant influence of the cultural context on construction practices and suggest a general need to recognize the diversity rather than suppressing it. Lack of cultural understanding and recognition of its diversity may lead to considerable managerial challenges in construction practices.

Keywords: case study, construction practice, cultural context, modularity, project-based production

INTRODUCTION

Project-based organizing is to an increasing extent applied in production practices today. As a consequence an increasing interest is shown by researchers into the field of project management. Although this has led to extensive work into the field some authors argue that the general scope and focus has been much too narrow (Söderlund, 2004). According to review of the literature by Packendorff (1995) the research suffers lack of empirical studies. This may question to what extent the existing organization theories are consistent with project management in practice. This calls for a practice-based perspective on project management where practices are perceived as individual, social and material entities which are context dependent. Accordingly, Söderlund (2004) calls for in-depth case studies in order to grasp and understand the dynamics, diversity, and fundamental issues in project-based organizing in its real-life context.

Addressing the call for empirical studies, this paper is based on three in-depth case studies of existing project-based production (PBP) practices within the construction industry in different cultural contexts. These working experiences across cultural

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contexts prepare the ground for an explorative and comparative investigation of the influence of the culture and social values on organizing construction practices.

Looking into the literature considerable empirical research has been made on the relationship between management practices and culture. Many of the findings from these studies (e.g. Pheng *et al.* 2002) support the thesis by Hofstede (1980) that each culture has a preferred coordination mechanism, implying better business performance is achieved when management practices are congruent with cultural values. However, whereas most of these empirical studies present findings based on quantitative investigations this paper is explorative and based on a qualitative research.

METHODOLOGY

This research combines an analytical framework with empirical data from three ethnographic studies. In contrast to many other empirical studies in the field of construction management research (e.g. Almahmoud *et al.* 2012 & Ling *et al.* 2012) the data collection is based on actual working experiences by the author as part of the construction management in three PBP practices in different cultural contexts. However, some methodological problems of participant research do exist as subjective interpretation by the researcher is inevitable. To accommodate this issue a general theoretical perspective is applied to substantiate and verify findings.

The three cases on PBP practices encompass: (1) *Construir Futuro S.A. in Quito, Ecuador*; (2) *Anker Hansen & co. A/S in Copenhagen, Denmark*; and (3) *E. Pihl & Soen A/S in Stockholm, Sweden*. These working experiences, of a period of 3-8 months each, have taken place in the period from June 2010 until August 2012.

The author was present in the projects, participating on a daily basis in the 'main' activities, which covered central meetings, workshops, and production activities. In addition to participant observation project members were interviewed. An extensive part of the material was codified field notes. Furthermore, formal project documents have been made available. This empirical material has been analyzed using an analytical framework combining Practice Based Theory and Modularization.

THEORY

According to Schilling (2000), modularity is a general systems concept, typically defined as a continuum describing the degree to which a system's components may be separated and recombined (p. 312). Given the open-ended nature of the concept, Campagnolo & Camuffo (2009) argue that every system is modular to some extent.

However since modularity mostly have been studied in stable settings (mass production environments) Thuesen (2012) develops a reinterpretation of modularity based on Practice based Theory (Nicolini 2012) in order to understand the dynamic and socio-technical nature of PBP practices. In the practical analysis of the modularity of socio-technical practices Thuesen (2012) suggests the following guiding questions with a special focus on how stability, standardization and repetition is practiced:

- What is produced/delivered (product modularity)
- How is it produced/delivered (process modularity)
- Who is producing/delivering it (organizational modularity)

Since every socio-technical system is modular it is interesting to start analyzing the modularity of different PBP practices in order to discover differences and similarities.

Given our interest in understanding the practices of PBP in different cultural contexts, the above mentioned framework is extended by a cultural dimension represented by the work of Geert Hofstede.

According to Hofstede, culture is formed through a series of drivers such as nature, climate, religion, history, and politics. It may be defined as *"the collective programming of the mind which distinguishes the members of one human from another"* (1980, p. 25). Based on a very comprehensive study of how values in the workplace are influenced by culture Hofstede identified four major value dimensions for comparing cultures. A numerical scale 0-100 indicates low to high values in the respective dimensions. Table 1 shows an overview of the four cultural dimensions.

Table 1: Characteristics of the four cultural dimensions by Hofstede (1980, 2013)

Cultural dimension (0-100)	Low score	High score
Power Distance Index (PDI) <i>Acceptance of hierarchy</i>	Low acceptance Equal rights Disagreement accepted	Hierarchy has privileges Subordinate awaits instructions No open disagreement
Individualism (IDV) <i>Handling relationships</i>	The group: "we" In-group opinion Indirect communication	The self: "I" Personal opinion Direct communication
Masculinity (MAS) <i>How we motivate</i>	Moving objectives/targets Interesting job, quality of life Consensus	Clear objectives/targets Career, wealth, status, success Confrontation
Uncertainty Avoidance Index (UAI) <i>Handling uncertainty</i>	Generalists Need for guidelines Informal/relaxed	Specialists, experts Need for rules and structure Formal/stressful

A central point of criticism with regard to the application of Hofstede's work is the assumed 'illusion of stability'. In relation to the cultural drivers it is possible that, over time, Hofstede's (1980) country scores used to create the cultural distance indices have lost predictive validity. However, most cross-cultural researchers assume that cultures are relatively stable systems in equilibrium (Brett et al., 1997, p.79). Even if these considerations suggest that the country scores applied in this paper may not reflect the present real-life cultural context to an exact degree, the scores still indicate the relative difference, thus not affecting the essence and ambition of this paper.

ANALYSIS

In order to better understand the practices of project based productions in different cultural contexts three cases have been investigated. An overview of these cases on construction practices is shown in Table 2.

Table 2: Cases on PBP practices in different cultural contexts

	Case 1	Case 2	Case 3
Company name	Construir Futuro (CF)	Anker Hansen & co. (AH)	E. Pihl & Soen (Pihl)
Project name	Victoria	Soelvgade School	Årsta-Älvsjö Railway Bridge
Construction sector	Housing	Education	Infrastructure
Project location	Quito, Ecuador	Copenhagen, Denmark	Stockholm, Sweden
Relative project scope	Medium scale	Medium scale	Large scale

Although these cases reflect three very different construction sectors it does not remove the frame of reference to better understand the cultural influence on the construction practices as each case is analyzed in its project-specific context by looking into the socio-technical modularity.

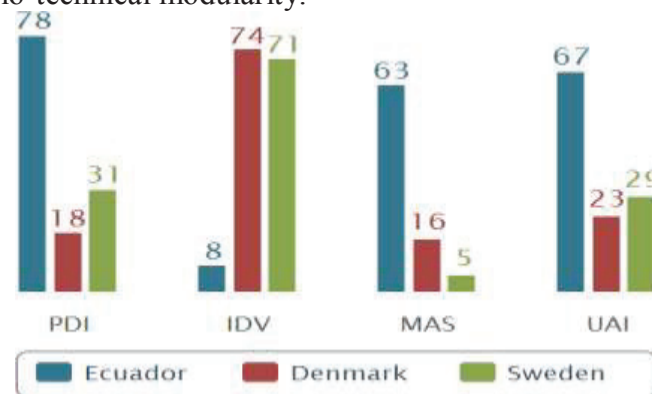


Figure1: Cultural value scores of Ecuador, Denmark, and Sweden (Hofstede, 2013)

In accordance with the theory by Hofstede (2013), Figure 1 shows the values of the cultural dimensions for each of the three national contexts which frame the PBP practices investigated. In agreement with the analytical framework we will now analyze the three PBP practices as listed in Table 2.

Case 1 – Ecuador

Product modularity

In order to accommodate a market demand of low cost family homes CF has developed a product design based on low complexity and high standardization allowing a low cost high speed construction practice.



Figure2: Standardized concrete segments applied at Victoria

Inspired by scientific management the multistory mass housing scheme of Victoria is based on a standardized and modular formwork system of concrete segments enabling

a standardized installation and integration of water, ventilation and electricity. The standardized concrete segments applied at Victoria are illustrated in Figure 2. Only a few materials are used like concrete, piping, cables, tiles, painting, glass, and wood.

Organizational modularity

Organizing construction practices of CF is based on an extensive integrated value chain covering all main processes from buying the lot to the final sales to the end consumer. This model is enabled by a series of sister companies including real estate, concrete delivery, pre-fabrication, and contracting (CF) extending to the management on site across all primary crafts. These conditions allow a flexible production practice on site and across similar projects based on the same modular and standardized product design. A continuous optimization and allocation of workers in the specific PBP practice and across projects may be made in respect to variable local sales.

In accordance with the standardized construction practice the project-based organizing is characterized by structure and rules. Each actor has a specific role with specific pre-defined tasks, however, subject to temporary collective activities across disciplines in times of variable local production needs on site. This project-based organizing is supported by a hierarchical framework. At the top, project management and the project manager is in charge of the daily production on site by communicating with the so-called “Maestro’s”, or foremen, of the respective crafts. In relation to the low complex product design only a few crafts interact in the PBP, primarily: masons, plumbers, electricians and unskilled construction workers doing the groundwork and formwork.

Process modularity

Inspired by scientific management the industrialized construction practice by CF separates design and production as two clearly distinct phases. By the design the entire building may be decomposed into a number of standardized subsystems with scientifically well-defined interfaces which also define the related production processes. In this way, the design and production are two integrated phases which link the rational construction together, through structure, standards and transparency.

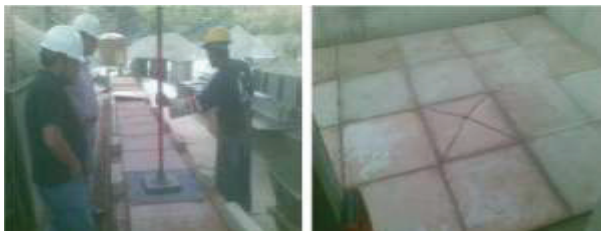


Figure 3: Pre-fabrication and installment of tiles

CF has developed a number of standard designs and procedures applied across all projects. The well-known design is described through detailed drawings and plans, but most importantly through similar practices across projects which enable a low cost and highly efficient construction practice. The standardized and modular concrete segments indicated in Figure 2 represent the cornerstone of the construction practice. In relation to the integrated value chain a parallel pre-fabrication of construction elements are made. These include, among others, concrete pipes and tiles. An example is illustrated in Figure 3 by the production and installation of tiles.



Figure 4: Soelvgade School

Case 2 - Denmark

Product modularity

In contrast to the standardized product design used by CF in Ecuador, Soelvgade School is characterized by its unique design driven by unique customer needs and supported by the complex technical evolution within the industry. Not only is the amount of different materials applied substantial, but the composition and general design is also very unique. Figure 4 shows a picture of Soelvgade School.

The unique and complex product design can be described by the diverse flooring in the building. Nine different types of flooring exist and in different colors: rubber floor (3), linoleum (4), tiles, parquet, sports floor, vinyl (3), painted, rubber mat, and epoxy cover. Additionally, greater fragmentation is identified between the design and production phases as six different specialists take part in this work.

Organizational modularity

The customer has teamed up with an engineering firm and an architectural firm as their project advisors assisting and guiding the customer to identify their needs in the complex world of construction and to follow-up on the actual product realization.

For the product realization the customer has signed a general contract with the contractor AH. No standardized construction practice similar to the one by CF in Ecuador frames the work by AH, nor the associated project-based organizing. Instead a network of specialists participates in the PBP to accommodate the unique customer needs. This implies an extensive use of skilled workers represented by various crafts and specialists such as sprinkler installers, window fitters, and joiners. All actors participating in the PBP practice are individual sub-contractors who each refer directly to the project management of AH.

Although this project-based organizing enables a high degree of flexibility it also leads to significant managerial challenges by the presence of a very fragmented value chain. Special requirements are demanded by the construction management to continuously organize the PBP across multiple disciplines and different individual agendas.

Process modularity

In contrast to the construction practice of CF in Ecuador much greater fragmentation between the design- and production phases characterizes the practice of AH. This is, among others, related to the organizational split to have someone to do the product design and someone else to do the product realization. Moreover, the combination of new technical solutions in an evolving construction industry and a fragmented value chain of cross-disciplinary sub-practices lead to a general fragmentation.

Based on these conditions, managing complexity is a key issue in the construction management. In comparison to scientific management other strategies and values are

applied to organize and manage the chaotic and complex project-based production. To achieve flexibility greater focus exists on values such as creativity and innovation rather than efficiency and standardization. These values become apparent by the application of continuous project-planning. That is, in order to learn and improve processes in the dynamic and emergent PBP practice the plan is continuously revised to reflect reality in the best way possible. Changes are made based on a continuous dialogue between the project management and the various disciplines and stakeholders participating in the PBP. The planning is divided into three degrees of specification: weekly plan, 6-week plan, and a total project plan.

Moreover, in order to deal with the complexity a comprehensive set of detailed drawings and associated product- and production descriptions exist and frame the PBP practice. These and other project documents are supported and handled by the means of, among others, information technology like CAD and document handling systems.

Case 3 – Sweden

Product modularity

The product design of the Årsta-Älvsjö Railroad Bridge (ÅÄRB) reflects the contractual foundation which it has been agreed upon. Based on a turnkey contract which describes a total responsibility of both the product design and realization Pihl has developed the overall best solution in accordance with customer needs; the best price, time, quality, etc. The contract encompasses the basic concrete structure (foundation, pillars, and deck) thus no specialized railway installation is included.

Although thousands of concrete bridges have been made before no bridge design is alike. Nor is the ÅÄRB similar to any other bridge. The fact that the bridge crosses a highway and other railway tracks twice on special designed portals during the 1.4 kilometers it spans indicates a unique and complex product design. In response to these challenges Pihl has created an innovative product design which combines aesthetics and quality with integrated standardized production processes.

Organizational modularity

In relation to the scope and complexity of the project the Swedish project owner has chosen to engage in a turnkey contract with the Danish contractor Pihl. In order to ensure conformity with the contract and local standards and norms representatives have been employed by the project owner to supervise the construction practice.

Pihl has organized the construction practice by a network of individual subcontractors taking care of the various processes in the realization of the product design. In relation to the product design and low material complexity only few crafts are present: construction workers, carpenters, and various specialists such as equipment- and blasting specialists. These are mostly represented by skilled workers.

Although the project-based organizing reflects a less fragmented value chain in comparison to the PBP practice of AH in Denmark other special challenges are identified in the construction management. In this case the contractor is responsible of both the design- and production phases, however, subject to the customers supervision and design approval with reference to the contract and local standards and norms. This model implies that a mutual understanding on when you know enough to initiate the production is crucial for a fluent PBP. However, this case shows two different perspectives on the link between the design- and production phases leading to a continuous dispute in the construction management



Figure 5: MSS applied for the construction of the bridge deck sections

Process modularity

In comparison to the two other PBP practices investigated this case reflects a partly integration between the design- and production phases. Based on the contractual framework Pihl has integrated and arranged a number of standardized production processes in connection with the unique product design. Most striking is the Movable Scaffolding System (MSS) applied for the bridge deck construction illustrated in Figure 5.

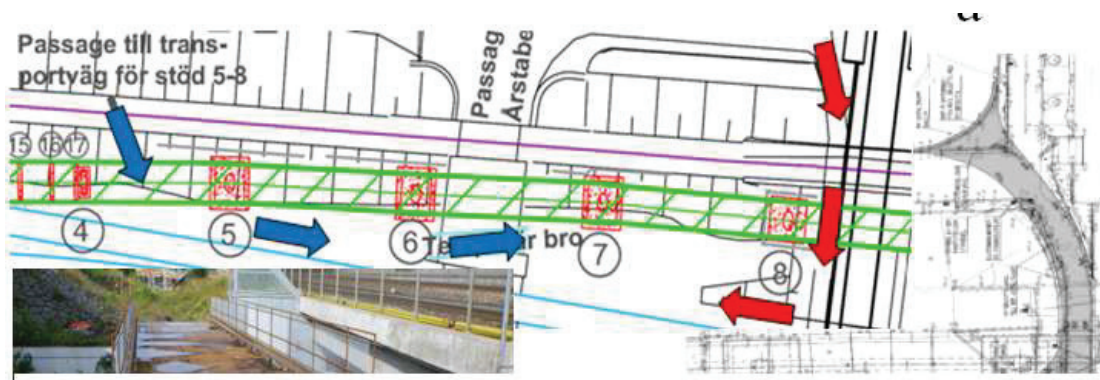


Figure 6: Change in access road to pillar 7 and 8 (red arrows indicate originally planned design and blue arrows indicate employed access road)

The MSS enables a standardized construction process of the bridge deck sections by a sequential preparation of the formwork, casting of concrete, and relocation of the MSS. However, due to the special curve traditional formwork is also required in the section interfaces which reflect the partial integration.

Similar to the construction practice of AH in Denmark continuous project-planning is applied allowing for gradual improvements to be integrated in the PBP based on project learning. An example is illustrated in Figure 6 showing a change in the access road to complete the bridge pillars 7 and 8. According to the original plan comprehensive ground work and sheet piling should be made. Instead an alternative solution was developed based on learning from similar challenges on site in achieving mobility near other pillar excavations: a temporary steel bridge solution was made across a passage to the existing train station resulting in substantial savings in comparison to the original plan.

SUMMARY

The following two Tables summarize the socio-technical modularity of the different PBP practices in different cultural contexts and identify its characteristics.

Table 4: Summary of the socio-technical modularity of the different construction practices

Case study	Cultural context	Modularity in PBP practice		
		Product	Process	Organization
Case 1 <i>Ecuador</i> <i>CF</i>	<i>Hierarchy cluster:</i> Hierarchy has privileges, collective dependence, formal confrontation, rules and structure, no open disagreement, etc. PDI: 78 IDV: 08 MAS: 63 UAI: 67	<i>Type:</i> Standardized mass housing scheme, medium scale <i>Material:</i> Concrete, reinforcement, glass, piping, electricity	Design and production integration 'No contract' (series of associated companies) Detailed drawings & plans, industrialization, standardized, disciplinary collaboration Scientific management	Collective Skilled(40)/Unskilled(60) Crafts: masons, plumbers, electricians, construction workers Designers: architects, engineers Managers: architects, engineers
Case 2 <i>Denmark</i> <i>AH</i>	<i>Network cluster:</i> Independent cooperation, autonomy, consensus, egalitarian, informal, open disagreement, etc. PDI: 18 IDV: 74 MAS: 16 UAI: 23	<i>Type:</i> Unique school building, medium scale <i>Material:</i> Concrete, (sheet) piling, steel, insulation, wood, linoleum, vinyl, rubber floor, tile, drain, piping, sprinkler system, alu, painting, fireproofing, glass, facing, heating, ceiling sheet, acoustic, IT, ventilation, electricity, automation, elevator	Design and production fragmentation General contract Detailed drawings, plans (weekly, 6-week, full scope), learning, IT, industrialization, creativity, cross-disciplinary collaboration Project management	Fragmented Skilled(90)/Unskilled(10) Crafts: masons, plumbers, electricians, construction workers, carpenters, floor-ring fitters, painters, joiners, sprinkler installers, window fitters, roofers, elevator installers, etc. Designers: architects, engineers Managers: engineers Contractors
Case 3 <i>Sweden</i> <i>Pihl</i>	<i>Network cluster:</i> Independent cooperation, autonomy, consensus, egalitarian, informal, open disagreement, etc. PDI: 31 IDV: 71 MAS: 05 UAI: 29	<i>Type:</i> Unique railway bridge structure (1.4km) excl. railway system, large scale <i>Material:</i> Concrete, reinforcement, (sheet) piling, steel, piping	Design and production fragmentation/integration Turnkey contract Detailed drawings, plans (weekly, 6-week, full scope), learning, IT, industrialization, creativity, cross-disciplinary collaboration Project management	Fragmented Skilled(70)/Unskilled(30) Crafts: construction workers, carpenters, MSS fitters, blasting specialists Designers: architects, engineers, contractors Managers: engineers Contractors

Table 5: Characteristics of the modularity of the different construction practices

Modularity	Case 1	Case 2	Case 3
<i>Value chain</i>	Integrated	Fragmented	Fragmented
<i>Interfaces</i>	Scientifically well defined	Blurred and locally negotiated	Locally negotiated
<i>Complexity</i>	Low	High	High
<i>Productivity</i>	High	Low	Low-Medium

The analysis shows that the socio-technical modularity of the different construction practices reflects the cultural context supporting Hofstede's proposition of preferred coordination mechanisms (1980). By looking into the differences and similarities across the three cases a central dilemma in PBP becomes apparent; stability versus flexibility. The modularity of the Ecuadorian PBP practice (*case 1*) is characterized by low complexity and a high degree of repetition resulting in high productivity. This construction practice is based on a primary focus on stability. In contrast, the Danish and Swedish PBP practices (*case 2* and *case 3*) are characterized by high complexity and a lower degree of repetition resulting in lower productivity. In these cases flexibility has a higher focus. This difference in focus and practice reflects the cultural context as the customer/market and institutional requirements, which are related to the same societal drivers as culture, generate different degrees of complexity and uncertainty to frame the PBP. In consequence different construction practices are needed.

DISCUSSION

By the cultural contexts a series of social values seem to be closely linked to the socio-technical modularity of the PBP practices leading to different ways of coupling and practicing the design and production processes.

The influence of societal development on PBP practices

As culture is formed through a series of societal drivers such as nature, climate, religion, history, and politics it emphasizes constant changes in modularity and PBP practices in a dynamic and turbulent world. This may to some extent explain the differences and similarities identified between the three cases and in particular between the PBP practice in Ecuador in comparison to those in Denmark and Sweden.

Although this diversity may lead to a series of challenges in international PBP it also prepares the ground for opportunities. In a globalizing world where companies are moving activities and production abroad in an attempt to lower cost and become more competitive this is particularly interesting. In order to move such activities successfully the findings suggest that the activities must fit into the specific cultural context. That is, standard tasks may be moved to countries and cultures which support such practices while other more complex tasks calling for other social values should be handled elsewhere. The major challenge in such international companies is how to balance this and establish a 'perfect split' aligning practices with the cultural contexts.

Managerial practices in different cultural contexts

The cultural context of Ecuador is characterized by social values such as formality, acceptance of hierarchy, collective dependence, and a demand for structure and rules. This cultural context indicates a reinforcing nature on the Ecuadorian PBP practice. The cultural context is consistent with the ambition to create a 'best practice' and to shape a social behavior and PBP practice based on scientific management and an

integrated value chain controlled by formal and codified agreements. Accordingly, the design and production processes are well integrated based on low complexity and scientifically well defined interfaces in the modularity. Everybody knows what to do and when to do it.

Similarly, the cultural context of Denmark and Sweden indicates a reinforcing nature on the respective PBP practices. However, in these cases both cultures are characterized by informality, network, autonomy, egalitarianism, and a perspective of rules as guidelines. These social values reflect and support a PBP practice characterized by its ability to deal with diverse, unique, and complex projects. Due to unique demands and a high degree of uncertainty the ambition is to create a 'local practice' and shape a social behavior and PBP practice that allows for creative ideas and initiatives to emerge and continuously be integrated in the production practice. Based on project learning the plan is continuously revised to optimize the production processes and get as close to reality as possible. These conditions emphasize the general fragmentation between the design and production processes.

Although the cultural context of Denmark and Sweden are similar a relative difference exists (ref. Figure 1 p.4). Based on these characteristics one may argue that the cultural difference generates or intensifies the existing continuous dispute in the construction management framing the PBP described in case 3. The Swedish project owner expects much greater detail, information and planning for the PBP. The cultural difference in the dimensions of MAS and UAI may to some extent explain this tendency. That is, the Swedish culture is characterized by a greater focus on processes and following rules and structure in comparison to the Danish culture. It indicates how cultural values influence and add to the complex and diverse nature of PBP.

CONCLUSION

The socio-technical modularity of the PBP practices indicates a significant influence by the cultural context. In agreement with research in the field this paper, which is based on an explorative and qualitative collection of data by participant research, verifies that cultural and social values are closely linked to the modularity of the PBP practices. Consistent with the value scores developed by Hofstede (2013) the cultural context reflects a reinforcing nature on the specific PBP practice. Similarly, challenges have been identified when different cultures interact in the construction management.

As culture is formed through a series of drivers in parallel to the societal development in a dynamic and turbulent world this also implies that modularity and PBP practices are in the making. This underlines the importance to acknowledge the dynamics and diversity in organizing construction practices.

The findings emphasize the importance of cultural understanding in organizing and managing PBP practices in different cultural contexts and suggest a general need to recognize the diversity rather than suppressing it. Managing PBP practices is rooted in the cultural context and need to be handled accordingly. In a world which is getting smaller and where handling cultural differences has grown into a competency of high importance it reflects to an increasing degree a fundamental issue in project management. This calls for special attention on the subject in a time where project-based organizing increasingly is applied in production practices.

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